Fund Council

12th Meeting (FC12)—Brussels, Belgium
November 4-5, 2014

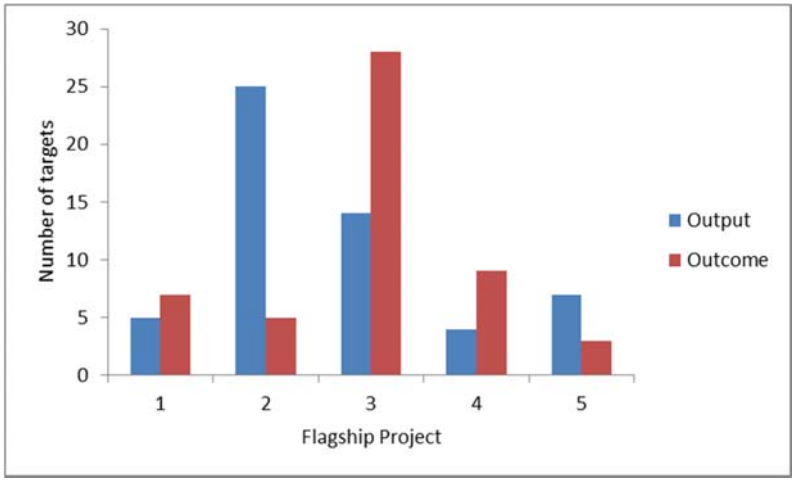
WORKING DOCUMENT

CRP on Grain Legumes Performance Matrix

Submitted by:
CRP on Grain Legumes

The table below describes the intended 'performance matrix' for the CGIAR Research Program on Grain Legumes in the extension phase (2015 and 2016). This draws extensively on the Annex 10 of the original proposal (http://1drv.ms/1gNUKVb) that provided a statement of output targets for the program up to 2017. These have been revised to take account new circumstances and the restructuring of the program by 'Flagships' rather than 'Product Lines'.

The original description of the program by Product Line had an output focus, while the Flagship Projects emphasise process along the trait delivery pipeline. For this reason some Flagship Projects are more focussed on outputs (experimental results) rather than outcomes (adoption of technologies). This is particularly noticeable for FP 2 Trait determination vs FP 3 Trait deployment as can be seen in the graph (right). In order to capture our intended progress and the timescale of breeding based technologies, we have included a list of intended outputs as well as outcomes by Flagship Project.



FP6 (CC1), Knowledge, Impacts, Priorities, and Gender is a crosscutting activity that informs and assesses the other FPs and so is not recorded as delivering any outcomes although output targets have been identified and will be included in the OWB for 2015 and 2016. Similarly FP7 (CC2) is a cross-cutting genomic and bioinformatic platform that achieves its delivery mainly through FPs 2 and 3. FP8 (CC3) is the project management including the competitive and commissioned grants scheme, the latter will achieve its delivery through the selected projects allied to relevant Product Lines and Flagship Projects, while the former will achieve its targets through the performance of the project as a whole.

FP	PL	Outputs (2015)	Outputs (2016)	Expected outcomes 2015 (Quantified)	Expected Outcomes 2016 (Quantified)	Means of verification*
Flagship Project 1 Managing productivity						
1	3	Better understanding of *A.flavus* infection biology expands opportunity for developing tolerant materials by breeding programs (CGIAR + NARS + private sector)	New knowledge deployed in population development and screening for low aflatoxin by the CGIAR scientists			Research reports from CGIAR scientists, PL3 progress reports
1	4			Inoculants released for trials		Report on locations, strain names
1	4			Technology developed for extending inoculum life by 50% under commercial conditions		Report on technology description, with whom shared, impact
1	5		Seed coating for cowpea seeds combining entomopathogens available to farmers in West Africa			Report
1	5				Entomopathogens with potential for pest management made available to NARS/industry	Report: The pod borer specific MaviMNPV is produced by women self-help groups in Benin in collaboration with the social enterprize SENS-Benin
1	5		An IPM system based on rational application of pesticides, agronomic practices, and crop cultivars developed			Report / Protocol
1	7			Protocols shared with NARS partners for implementation of herbicide and machine harvesting and being implemented		Report on locations, protocols, crops/varieties
1	6		Integrated crop management		Package of practices for	Region specific booklets on

			practices for extra early varieties for short season environments developed		cultivation of extra early varieties of chickpea and lentil made available to NARS	ICM technologies; number of farmers and areas of chickpea and lentil adopting ICM technologies; publications
1	8			At least 2 - 3 hybrids with 25 – 30% higher yield than the best available cultivars developed and shared with NARS partners		Archival reports of ICRISAT and AICRP (ICAR) Reports
1	8			ICM technologies including seed treatment, spacing, fertilizer doses and need based application of pesticides developed and promoted in different agro-ecologies		Archival Reports and Booklets on ICM technologies, Publications

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Flagship Project 2 Trait determination						
2	1			Four traits uploaded into the Trait Ontology list, to be available for fieldbook being developed by IBP		IBP documentation
2	1	Transcriptome of 2 contrasting common bean and 2 tepary beans compared for identification of genes associated with grain filling under drought or low P				Report / Public database entry
2	1	At least 3 elite sources for 2 traits related to low P and drought tolerance identified per crop				line names, with whom shared, efficacy
2	2	Candidate genes for heat tolerance identified				Report / Public database entry
2	3	Two RIL populations per region (SSA and SA) developed and or advanced expand breeding pipelines for groundnuts by CGIAR for wider dissemination	At least 2 advanced materials provided to NARs partners for adaptability evaluation			W3 project reports involving CG and NARS partners, W2 project reports by CGIAR, PL 3 reports detailing new the line names, with whom shared
2	3	Candidate transgenic events introgressed into elite material for evaluation of efficacy by breeding programmes	At least 2-3 elite and released materials included in conversion by genotypes carrying transgenic traits initiated centrally at ICRISAT			Research reports from CGIAR scientists, PL3 progress reports
2	3	RAPs that condition low aflatoxin production identified to experiments for use in breeding	RAPs that condition low aflatoxin production identified to experiments for use in breeding			Research reports from CGIAR scientists, PL3 progress reports
2	3	Candidate transgenic for Vitamin A events	At least 2-3 elite and released materials included in			Research reports from CGIAR scientists, PL3 progress

		introgressed into elite material for evaluation of efficacy by breeding programmes	conversion by genotypes carrying transgenic traits initiated centrally at ICRISAT			reports
2	4	Rhizobial strains characterized using 16S rDNA				Report / Public database entry
2	5		At least 3 chickpea, cowpea and pigeonpea transgenic events with Bt genes for resistance to pod borers bio-assayed under greenhouse and contained field conditions.		At least two cowpea lines with introgressed Bt transgene shared with NARS for CFT.	Report / Public database entry / Peer reviewed publication
2	6	Extra-early diverse germplasm with resistance to key biotic and abiotic stresses identified	Earliness is dissected in its component traits and germplasm for each component identified. At least two sources for different components of earliness and resistance identified and used in the crossing program			Report/publications, number of crosses using new germplasm
2	6	Novel genes for earliness identified by studying allelic relationships of genes. Genetic and genomics resources generated for use in breeding program				Report / Public database entry / Peer reviewed publication
2	7		Candidate genes and molecular markers identified and validated for herbicide tolerance in chickpea, faba bean and lentil			Report / Public database entry / Peer reviewed publication
2	7		Molecular markers identified and validated for parasitic weed tolerance in faba bean			Report / Public database entry / Peer reviewed publication

			and lentil			
2	8			New cytoplasmic sources (for CMS) identified and utilized in hybrid breeding	New cytoplasmic sources (for CMS) identified and utilized in hybrid breeding	Archival Reports, Publications, HPRC reports
2	8	Parents for mapping fertility restorers identified				Archival Reports, Project Reports, Publications
2	8			Disease resistance lines identified and used for crop improvement		Archival Reports, Project Reports, Publications
2	8	Pigeonpea lines screened for resistance to pod borers	Pigeonpea lines screened for resistance to pod borers			Archival Reports, Project Reports, Publications
2	8	Transgenic events developed for pod borer and SMD resistance	Transgenic events tested for pod borer and SMD resistance			Archival Reports, Project Reports, Publications

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Flagship Project 3 Trait deployment						
3	1			Farmers have selected preferred varieties at 50 locations	NARS partners use at least 10 drought tolerant cowpea and bean lines in crossing and multilocation adaptation trials.	Reports: At least 20 crosses generated by NARS partners in Burkina Faso, Senegal, Kenya, Ethiopia and/or Uganda
3	1				Drought QTLs are being used by at least 2 NARS in local breeding programs	Report
3	1				3 countries in Africa (Madagascar, Burundi, Uganda) test from 3 to 5 different products based on beans or soybeans.	Reports, Company records
3	1		Groundnut lines with combinations of 2 or 3 stress tolerance traits available for testing			Report
3	2			At least one national program adopts methods for evaluating heat tolerance. [CORPOICA (Colombia) employs methods for pollen viability.]		Report:
3	2			Collaborative screening projects with NARS scientists		Report on: locations, names, objectives
3	2	At least 15 heat tolerant breeding lines each in chickpea, common bean, faba bean and lentil with >30% higher yield compared to the heat sensitive cultivars under heat stress, and with improved grain quality				Report on: line names, with whom shared, efficacy

3	2	At least 10 breeding lines with heat tolerance and resistance to dry root rot developed				Report on: line names, with whom shared, efficacy
3	2				The available heat tolerant cultivars of chickpea evaluated by at least 1,000 farmers in India and Bangladesh, and common bean evaluated by 500 farmers in Brazil and Mexico (Y6)	Report on: Cultivar names, evaluation location, # Farmers disaggregated by gender
3	3			20 nutrient dense groundnut varieties shared with NARS partners		Report on: variety and partner names, numbers of the same
3	3			Short duration groundnut PVS trials		Report on: locations, names, objectives
3	3	2-3 Pre-release groundnut lines available per country enters National performance trials for final release	Final evaluation and submissions for release of at least 2-3 new superior groundnut materials along with production practices by partner NARS	At least 2-3 farmer preferred groundnut varieties identified in each target location through FPVS trials.		W3 project reports involving CG and NARS partners, W2 project reports by CGIAR, PL 3 reports detailing new the line names, with whom shared
3	3	Breeding programmes access new sources of novel traits to deploy in aflatoxin breeding process	At least 2-3 new populations developed by NARS using new sources of novel traits			W3 project reports involving CG and NARS partners, W2 project reports by CGIAR, PL 3 reports detailing new the line names, with whom shared
3	3	20 new lines provided to partners and evaluated for adaptability and release, providing candidates for new groundnut varieties	Annual infusion of at least 20 elite materials strengthens NARS groundnut breeding programme, expanding new variety options for variety release	At least 20 short-duration breeding lines with low to moderate levels of resistance to rust and late-leaf spot and/or early leaf spot developed and shared with partners.		W3 project reports invovling CG and NARS partners, W2 project reports by CGIAR, PL 3 reports detailing new the line names, with whom shared
3	4			Collaborative screening		Report on: collaborative trials

				projects with NARS scientists		with the OFRA project in Kenya (Catherine Kibunja), Tanzania (John Msaky), Rwanda (Leone Nabahungu), under supervision of Charles Wortmann.
3	4			Climbing bean varieties/lines in PVS trials in at least 3 countries		Report on: trials of at least 10 lines each with Magdeline Williams (Tanzania), Augustine Musoni (Rwanda), Ruben Otsyula (Kenya).
3	5			10 sources of resistance in trials by NARS partners- At least 5 sources of resistance to target insect pests identified and made available to NARS partners		Reports from: NARS partners are testing the resistant cultivars at Ile Ife (OAU) and Zaria(ABU) (Nigeria); Maroua and Garoua (IRAD-Cameroon); Cinzana (IER-Mali); INRA (Morocco); EIAR (Ethiopia); Potential users: INERA-Burkina Faso, SARI-Ghana, ARI-Tanzania
3	5			Integrated Pest Management practices tested by NARS partners		Different formulations of neem oil productus are tested by NARS collaborators and farmer groups in Benin, Burkina Faso, Niger and Ghana (Reports); different IPM options tested by NARS collaborators in Morocco (INRA) and Ethiopia (EIAR)
3	6	Extra early disease resistant varieties of chickpea and lentil developed	Additional extra early disease resistant varieties of chickpea and lentil developed	At least 10 extra-early breeding lines with improved grain quality traits and a range of pathogen resistances developed and shared with NARS partners.	Additional New extra early lines with a range of pathogen resistances and grain quality traits are shared with NARS partners for trials	Report on: locations, names, numbers, classes of resistance, number of international nurseries shared with NARS partners

3	7			lines with herbicide and parasitic weed tolerance in multilocation trials with NARS partners		Report on: locations, names, numbers, classes of tolerance/resistance; number of lines in international nurseries distributed to NARS partners
3	7			lines with mechanical harvestability traits in multilocation trials with NARS partners		Report on: locations, names, numbers, characteristics, number of lines in international nurseries distributed to NARS partners
3	8	Stabilized new CMS sources for enhancing the hybrid breeding programme			Stabilized new CMS sources for enhancing the hybrid breeding programme	Archival Reports, Project Reports, Publications
3	8	Mapping population for fertility restoration genes developed				Archival Reports, Project Reports, Publications
3	8	Phenotyping of mapping population for fertility restoration completed			Molecular markers linked to fertility restorer genes / QTLs identified,	Archival Reports, Project Reports, Publications
3	8			Pigeonpea hybrid parents with wilt, Sterility Mosaic Disease and Phytopthora resistance identified and shared with NARS		Archival Reports, Project Reports, Publications

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Flagship Project 4 Seed systems, post-harvest processing, markets and nutrition						
4	1			400,000 households reached with improved bean, soybean, and cowpea varieties.	Another 400,000 households reached with improved bean, soybean, and cowpea varieties.	Reports on: Seed produced and distributed. BEAN (per year): Ethiopia: 5000 tons. Uganda 3000 tons .Tanzania : 600 tons .Kenya 600 tons .Zimbabwe 600 tons .COWPEA: Burkina Faso: 1200t, Mali: 1600t, Nigeria: 4000t, Ghana: 1600t, Mozambique: 320t, Tanzania: 320t, Niger: 640t. SOYBEAN: Nigeria: 1000t, Kenya: 100t, Mozambique: 400t.
4	3	Seed road maps and production of different classes of seed for 2-3 newly released material used by partners including NARS	At least 2 new varieties promoted by NARS partners and strategic partnerships brokered to produce and deliver seed to farmers in target countries	At least two new short-duration varieties available for seed production chain.		W3 project reports involving CG and NARS partners, W2 project reports by CGIAR, PL 3 reports detailing new the line names, with whom shared
4	6	Effective seed delivery using both formal and informal seed systems for extra early varieties established	Effective seed delivery using both formal and informal seed systems for extra early varieties established	Seeds for at least 1000 ha farmland produced and distributed to NARS partners	Seeds for at least 1000 ha farmland produced and distributed to NARS partners	Reports; Number of seed hub established, quantity of seeds distributed and area under improved varieties and number of farmers adopting those varieties
4	8			At least 2 post-harvest processing technologies for pigeonpea made available to stakeholders for enhancing the value chain		Number of technologies standardized and enterer in value chain , Archival Reports and Project Reports
4	8			At least 4 NGOs/farmer groups facilitate the scaling up of pigeonpea hybrid seed		Archival Report

				production		
4	8			Commercial pigeonpea hybrid cultivation production promoted in at least 100,000 ha	Commercial hybrid cultivation production promoted in at least 100,000 ha	Seed production particulars of Seed Corporations, NARS and Private Sectors.

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Flagship Project 5 Capacity Building and Partnerships						
5	1	At least 3 PhD Students use CGIAR research sites for thesis activities				1 PhD student graduated in Colombia, and 2 in Nigeria by 2016. University records, Reports
5	1	At least 30 NARS researchers provided short-term training on tools and techniques (e.g. phenotyping; molecular breeding) for improving abiotic stress tolerance in GLs				Report on: Names (gender) , origin, training
5	4	10 technicians from industry and NARS trained				Report on: Names (gender) , origin, training
5	6	Capacity of stakeholders (NARS scientists, extension personnel and farmers) on production and improvement of extra early varieties	Capacity of stakeholders (NARS scientists, extension personnel and farmers) on production and improvement of extra early varieties	At least 2 students 20 NARS scientists, 50 extension persons and 200 farmers given training on legumes improvement and cultivation	At least 2 students and 20 NARS scientists, 50 extension persons and 200 farmers given training on legumes improvement and cultivation	Report on capacity building; Manual on grain legumes; number of stakeholders trained; number of students and thesis
5	7	Capacity of stakeholders (NARS scientists, extension personnel and farmers) on machine harvestable production technologies	Capacity of stakeholders (NARS scientists, extension personnel and farmers) on machine harvestable technologies	At least 3 students and 30 NARS scientists, and 100 farmers trained	At least 3 students and 30 NARS scientists, and 100 farmers trained	Report on capacity building; number of stakeholders trained; number of students and thesis submitted